

What is claimed is:

1. A digital audio recording and reproducing apparatus comprising:
 - an A/D converter for converting an analog audio signal collected by a microphone into digital audio data;
 - a digital compression circuit for compressing said digital audio data such that the analog audio signal of sixty seconds is converted into compressed digital audio data of not larger than 100K bytes;
 - an internal solid state memory for storing said compressed digital audio data;
 - a digital decompression circuit for decompressing said compressed digital audio data read out of said internal solid state memory to generate decompressed digital audio data;
 - a D/A converter for converting said decompressed digital audio data into an analog audio signal;
 - a reproducing means for reproducing said analog audio signal supplied from said D/A converter; and
 - an output means for outputting said compressed digital audio data to an external computer such that the compressed digital audio data has a file format which can be directly treated by the external computer.
2. A digital audio recording and reproducing apparatus according to claim 1, wherein said output means for outputting the compressed digital audio data to the external computer comprises a connecting terminal for connecting detachably an external solid state memory.
3. A digital audio recording and reproducing apparatus according to claim 2, wherein said external solid state memory is used to store the compressed digital audio data like as said internal solid state memory.
4. A digital audio recording and reproducing apparatus according to claim 2, wherein a digital data transmission is effected between said internal

solid state memory and said external solid state memory.

5. A digital audio recording and reproducing apparatus according to claim 2, wherein a digital audio signal stored in said external solid state memory is read out and is supplied to said decompression circuit.

6. A digital audio recording and reproducing apparatus according to claim 1, wherein said output means for outputting the compressed digital audio data to the external computer comprises a cable connecting terminal to which one end of a connection cable is detachably connected, the other end of said connection cable being connected to the external computer.

7. A digital audio recording and reproducing apparatus according to claim 1, wherein said output means for outputting the compressed digital audio data to the external computer comprises a transmitter which transmits the compressed digital audio data by means of a radio wave signal or an optical signal to a receiver provided in the external computer.

8. A digital audio recording and reproducing apparatus according to claim 1, wherein said output means for outputting the compressed digital audio data to the external computer comprises a modem and a communication line connecting terminal connected to said modem.

9. A digital audio recording and reproducing apparatus according to claim 1, wherein said internal solid state memory and external solid state memory are formed by a non-volatile semiconductor memory without a back-up battery.

10. A digital audio recording and reproducing apparatus according to claim 1, wherein said digital compression circuit is constructed such that the digital audio data is compressed in accordance with an audio coding system based on the ITU-T recommendation G723.1.

11. A digital audio recording and reproducing apparatus according to claim 1, wherein said file format of the compressed digital audio data

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outputted to the external computer is WAVE file, while the computer works on Windows.

12. A digital audio recording and reproducing apparatus comprising:
 - an A/D converter for converting an analog audio signal collected by a microphone into digital audio data;
 - a digital compression circuit for compressing said digital audio data into compressed digital audio data;
 - an internal solid state memory for storing said compressed digital audio data;
 - a digital decompression circuit for decompressing said compressed digital audio data read out of said internal solid state memory to generate decompressed digital audio data;
 - a D/A converter for converting said decompressed digital audio data into an analog audio signal;
 - a reproducing means for reproducing said analog audio signal supplied from said D/A converter; and
 - an external memory connecting terminal for connecting detachably an external solid state memory for storing said compressed digital audio data instead of or together with said internal solid state memory;
- wherein when it is detected that the external solid state memory is removed from said external memory connecting terminal during a recording operation using the external solid state memory, the recording operation is temporally interrupted, and after detecting that the relevant external solid state memory is connected to said external memory connecting terminal, the interrupted recording operation is restarted.

13. A digital audio recording and reproducing apparatus according to claim 12, wherein when the external solid state memory is detected to be removed from the external memory connecting terminal during the recording

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operation using the external solid state memory, a warning for requesting a user to connect the relevant external solid state memory to the external memory connecting terminal is generated.

14. A digital audio recording and reproducing apparatus according to claim 12, wherein when it is detected that an external solid state memory different from the external solid state memory which has been removed from the external memory connecting terminal during the recording operation is connected to the external memory connecting terminal, a warning for indication that the currently connected external solid state memory is different from that removed during the recording operation is generated.

15. A digital audio recording and reproducing apparatus comprising:
an A/D converter for converting an analog audio signal collected by a microphone into digital audio data;
a digital compression circuit for compressing said digital audio data into compressed digital audio data;
an internal solid state memory for storing said compressed digital audio data;
a digital decompression circuit for decompressing said compressed digital audio data read out of said internal solid state memory to generate decompressed digital audio data;
a D/A converter for converting said decompressed digital audio data into an analog audio signal;
a reproducing means for reproducing said analog audio signal supplied from said D/A converter; and
an external memory connecting terminal for connecting detachably an external solid state memory for storing said compressed digital audio data instead of or together with said internal solid state memory;
wherein said apparatus includes;

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a normal reproduction mode in which a signal digital audio data file selected from digital audio date files stored in said internal solid state memory and/or external solid state memory is reproduced only once;

a single file repeat mode in which a single digital audio data file selected from digital audio date files stored in said internal solid state memory and/or external solid state memory is reproduced repeatedly;

a plural file continuous repeat mode in which a plurality of digital audio data files stored in said internal solid state memory and/or external solid state memory are successively reproduced only once; and

a plural file repeat mode in which a plurality of digital audio data files stored in said internal solid state memory and/or external solid state memory are successively reproduced in a repeated manner.

16. A digital audio recording and reproducing apparatus according to claim 15, wherein in said plural file repeat reproduction mode, all digital audio data files stored in said internal solid state memory and/or external solid state memory are successively reproduced in a repeated manner.

17. A digital audio recording and reproducing apparatus according to claim 15, wherein in said plural file repeat reproduction mode, a plurality of digital audio data files selected from all digital audio data files stored in said internal solid state memory and/or external solid state memory are successively reproduced in a repeated manner.

18. A digital audio recording and reproducing apparatus according to claim 15, wherein in said plural file repeat reproduction mode, the order of reproducing a plurality of digital audio data files is set by a user.

19. A digital audio recording and reproducing apparatus according to claim 15, wherein a plurality of digital audio data files are stored in said internal solid state memory and/or external solid state memory with ordinal file numbers, and in said plural file continuous reproduction mode, a plurality

of digital audio data files from a digital audio data file having a file number denoted by a user to a digital audio data file having the last file number are successively reproduced.

20. A digital audio recording and reproducing apparatus according to claim 15, wherein during said plural file continuous reproduction mode or plural file repeat reproduction mode, when a repeat button is operated by a user in response to a reproduction of a desired speech, said plural file continuous reproduction mode or plural file repeat reproduction mode is automatically interrupted and said single file repeat reproduction mode is automatically started to reproduce repeatedly a currently reproduced digital audio data file.

21. A digital audio recording and reproducing apparatus according to claim 15, wherein when said automatically started single file repeat reproduction mode is stopped in response to a user's operation, the interrupted plural file continuous reproduction mode or plural file repeat reproduction mode is restarted.

22. A digital audio recording and reproducing apparatus comprising:
an A/D converter for converting an analog audio signal collected by a microphone into digital audio data;
a digital compression circuit for compressing said digital audio data into compressed digital audio data;
an internal solid state memory for storing said compressed digital audio data;
a digital decompression circuit for decompressing said compressed digital audio data read out of said internal solid state memory to generate decompressed digital audio data;
a D/A converter for converting said decompressed digital audio data into an analog audio signal; and

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a reproducing means for reproducing said analog audio signal supplied from said D/A converter;

wherein said internal solid state memory has a data zone divided into a normal data storage area storing digital audio data files of normal speeches and an alarm data storage area storing at least one digital audio data file of an alarm message, and the digital audio data file stored in the alarm data storage area could not be erased at least by a normal operation for erasing one or more digital audio data files stored in the normal data storage area.

23. A digital audio recording and reproducing apparatus according to claim 22, wherein in a normal reproduction mode, only the normal data storage area can be accessed, and in an alarm reproduction mode, only the alarm data storage area can be accessed.

24. A digital audio recording and reproducing apparatus according to claim 22, wherein when no alarm message is recorded, an alarm sound is generated at a time present by a user.

25. A digital audio recording and reproducing apparatus comprising:
an A/D converter for converting an analog audio signal collected by a microphone into digital audio data;
a digital compression circuit for compressing said digital audio data into compressed digital audio data;
an internal solid state memory for storing said compressed digital audio data;
a digital decompression circuit for decompressing said compressed digital audio data read out of said internal solid state memory to generate decompressed digital audio data;
a D/A converter for converting said decompressed digital audio data into an analog audio signal;
a reproducing means for reproducing said analog audio signal supplied

from said D/A converter;

a power source for energizing said circuits and including at least one battery; and

a battery check circuit for checking an output voltage of said power supply;

wherein when the output voltage of the power source is higher than a threshold value at which the apparatus could not work correctly, but becomes not higher than a first level, this condition is displayed;

when the output voltage of the power source is higher than said threshold value, but becomes not higher than a second level, this condition is displayed;

when the output voltage of the power source becomes not higher than said second level during the recording operation, data management information for currently recorded digital audio data is automatically saved and the recording operation is automatically stopped.

26. A digital audio recording and reproducing apparatus according to claim 25, wherein when the output voltage of the power source reaches a third level lower than said second level but is slightly higher than said threshold value, the power supply to the various portions of the apparatus is automatically stopped.

27. A digital audio recording and reproducing apparatus according to claim 25, wherein when the output voltage of the power source becomes not higher than said second level during the recording operation using an external solid state memory which is detachably connected to the apparatus, data management information for currently recorded digital audio data is read out of RAM provided in the apparatus and is stored in a FAT area in the external solid state memory, and then the recording operation is stopped.

28. A digital audio recording and reproducing apparatus according to claim 25, wherein when the output voltage of the power source is in a range

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between a maximum value and a middle value between the maximum value and said first level, an indication representing this condition is displayed, and when the output voltage of the power source is in a range between said middle value and said first level, an indication representing this condition is displayed.

29. A digital audio recording and reproducing apparatus comprising:

an A/D converter for converting an analog audio signal collected by a microphone into digital audio data;

a digital compression circuit for compressing said digital audio data such that the analog audio signal of sixty seconds is converted into compressed digital audio data of not larger than 100K bytes;

an internal solid state memory for storing said compressed digital audio data;

a digital decompression circuit for decompressing said compressed digital audio data read out of said internal solid state memory to generate decompressed digital audio data;

a D/A converter for converting said decompressed digital audio data into an analog audio signal;

a reproducing means for reproducing said analog audio signal supplied from said D/A converter;

an output means for outputting said compressed digital audio data to an external computer such that the compressed digital audio data has a file format which can be directly treated by an external;

a power source for energizing said circuits and including at least one battery; and

a battery check circuit for checking an output voltage of said power supply;

wherein

when it is detected that the external solid state memory is removed from

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said external memory connecting terminal during a recording operation using the external solid state memory, the recording operation is temporally interrupted, and after detecting that the relevant external solid state memory is connected to said external memory connecting terminal, the interrupted recording operation is restarted:

said apparatus includes

a normal reproduction mode in which a signal digital audio data file selected from digital audio date files stored in said internal solid state memory and/or external solid state memory is reproduced only once;

a single file repeat mode in which a single digital audio data file selected from digital audio date files stored in said internal solid state memory and/or external solid state memory is reproduced repeatedly;

a plural file continuous repeat mode in which a plurality of digital audio data files stored in said internal solid state memory and/or external solid state memory are successively reproduced only once; and

a plural file repeat mode in which a plurality of digital audio data files stored in said internal solid state memory and/or external solid state memory are successively reproduced in a repeated manner:

said internal solid state memory has a data zone divided into a normal data storage area storing digital audio data files of normal speeches and an alarm data storage area storing at least one digital audio data file of an alarm message, and the digital audio data file stored in the alarm data storage area could not be erased at least by a normal operation for erasing one or more digital audio data files stored in the normal data storage area; and

when the output voltage of the power source is higher than a threshold value at which the apparatus could not work correctly, but becomes not higher than a first level, this condition is displayed;

when the output voltage of the power source is higher than said threshold

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value, but becomes not higher than a second level, this condition is displayed; and

when the output voltage of the power source becomes not higher than said second level during the recording operation, data management information for currently recorded digital audio data is automatically saved and the recording operation is automatically stopped.